The influence of disorder on the phase diagram of the Kondo necklace: A mean field renormalization group approach.[*]

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In this work we study the influence of disorder on the antiferromagnetic quantum critical point (QCP) of Kondo lattice systems. In order to assess the critical behavior of heavy fermions near an antiferromagnetic QCP, we apply the mean-field renormalization group (MFRG)[†] to the Kondo necklace. This RG method combines mean field results for small clusters of spins and renormalization group ideas. While mean field theory identifies the order parameter of the cluster with the order parameter of the entire system, the MFRG assumes that the former rescales with the cluster size.

The quantum phase transition between the antiferromagnetic and non-magnetic ground states in heavy fermion materials in usually tuned by pressure or composition. Since the later introduces disorder in the system, an important problem in the study of these materials is understanding the role of disorder on the vicinity of the QCP. As the MFRG approach can also be adapted to disordered systems [‡], we study the effect of disorder on the on-site interactions J on the critical point and critical lines of the Kondo necklace. We consider the cases of dilution and bimodal disorder.

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